

Algebra 2 5.0

CUMULATIVE REVIEW

Name: _____

Key

Algebra 2 5.0 FINAL EXAM -

Date: _____ **Time:** _____ **Room:** _____

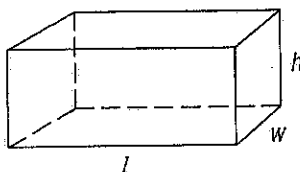
ALGEBRA II FORMULA SHEET

Formulas that you may need to solve questions on this exam are found below.
You may use calculator π or the number 3.14.

Shapes



$$A = lw$$



$$V = lwh$$

Data Analysis

Permutation: ${}_nP_r = \frac{n!}{(n-r)!}$

Combination: ${}_nC_r = \frac{n!}{r!(n-r)!}$

Exponential Properties

$$a^m \cdot a^n = a^{m+n}$$

$$(a^m)^n = a^{m \cdot n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$a^{-1} = \frac{1}{a}$$

Powers of the Imaginary Unit

$$i = \sqrt{-1}$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

Logarithmic Properties

$$\log_a x = y \leftrightarrow x = a^y \quad \log x = y \leftrightarrow x = 10^y \quad \ln x = y \leftrightarrow x = e^y$$

$$\log_a (x \cdot y) = \log_a x + \log_a y$$

$$\log_a x^p = p \cdot \log_a x$$

$$\log_a \frac{x}{y} = \log_a x - \log_a y$$

Quadratic Functions

General Formula: $f(x) = ax^2 + bx + c$

Standard (Vertex) Form: $f(x) = a(x - h)^2 + k$

Factored Form: $f(x) = a(x - x_1)(x - x_2)$

Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

when $ax^2 + bx + c = 0$ and $a \neq 0$

Compound Interest Equations

Annual: $A = P(1 + r)^t$

A = account total after t years

Periodic: $A = P \left(1 + \frac{r}{n} \right)^{nt}$

P = principal amount

r = annual rate of interest

t = time (years)

Continuous: $A = Pe^{rt}$

n = number of periods interest is compounded per year

1.) If $(2 - bi) + (3 - 5i) = 5 + 8i$, what is the value of b ?

$$\begin{aligned} 2+3 &= 5 \\ \text{true!} \end{aligned} \quad \begin{aligned} -bi - 5i &= 8i \\ +5i + 5i & \\ \hline -bi &= 13i \\ -b &= 13 \\ \boxed{b} &= \boxed{-13} \end{aligned}$$

1. YOU TRY: If $(4 - bi) - (7 - 5i) = -3 + 8i$, what is the value of b ?

$$\begin{aligned} 4-7 &= -3 \\ \text{true!} \end{aligned} \quad \begin{aligned} -bi - -5i &= 8i \\ -bi + 5i &= 8i \\ -bi &= 3i \\ -b &= 3 \\ \boxed{b} &= \boxed{-3} \end{aligned}$$

2.) Simplify $\frac{3}{2-3i} \cdot \frac{(2+3i)}{(2+3i)}$ Conjugate!

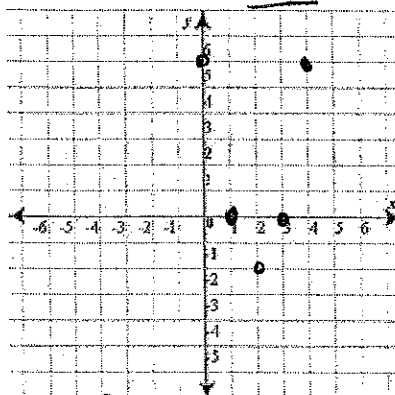
$$\begin{aligned} \frac{6+9i}{4 + \cancel{6i} - \cancel{6i} - 9i^2} &= \boxed{\frac{6+9i}{13}} \\ 4 - 9(-1) & \\ 4+9 & \\ 13 & \end{aligned}$$

2. YOU TRY: Simplify $\frac{-2}{3-4i} \cdot \frac{(3+4i)}{(3+4i)}$

$$\begin{aligned} \frac{-6-8i}{9 + \cancel{12i} - \cancel{12i} - 16i^2} &= \boxed{\frac{-6-8i}{25}} \\ 9 - 16(-1) & \\ 9+16 & \\ 25 & \end{aligned}$$

3.) The table below represents a quadratic function. Using a graph what are the zeros of $f(x)$? XMT!

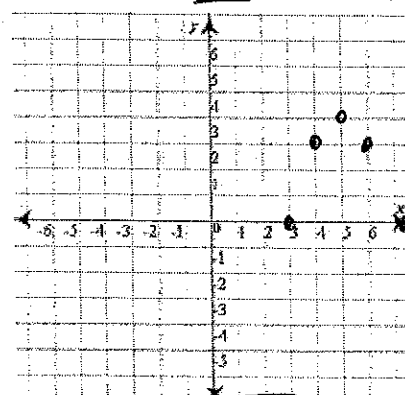
| x | f(x) |
|---|------|
| 0 | 6 |
| 2 | -2 |
| 3 | 0 |
| 4 | 6 |



$(1, 0) (3, 0)$

3.) YOU TRY: The table below represents a quadratic function. Using a graph what are the zeros of $f(x)$? XMT!

| x | f(x) |
|---|------|
| 3 | 0 |
| 4 | 3 |
| 5 | 4 |
| 6 | 3 |



$(3, 0) (7, 0)$

4.) What is the equation of the parabola with vertex $(-1, 3)$ passes through the point $(-2, -2)$?

h k x y

$$y = a(x-h)^2 + k$$

plug in #s solve for a

$$-2 = a(-2+1)^2 + 3$$

$$-2 = 1a + 3$$

$$-5 = a$$

$$y = -5(x+1)^2 + 3$$

4.) YOU TRY: What is the equation of the parabola with vertex $(3, 2)$ passes through the point $(-2, -3)$?

h k x y

$$-3 = a(-2-3)^2 + 2$$

$$-3 = 25a + 2$$

$$-5 = 25a$$

$$-\frac{5}{25} = a \quad a = -\frac{1}{5}$$

$$y = -\frac{1}{5}(x-3)^2 + 2$$

5.) The area of a rectangle is defined by the function $f(x) = x^2 + 3x - 10$. Determine the value(s) of x if the area is 98 ft^2 .

$$x^2 + 3x - 10 = 98$$

$$\begin{array}{r} x^2 + 3x - 10 = 98 \\ -98 \quad -98 \\ \hline x^2 + 3x - 108 = 0 \\ (x+12)(x-9) = 0 \\ x = -12, 9 \end{array}$$

since area, only $(+)$ answers!

$$x = 9$$

5.) YOU TRY: The area of a rectangle is defined by the function $f(x) = x^2 - 7x + 12$. Determine the value(s) of x if the area is 84 ft^2 .

$$x^2 - 7x + 12 = 84$$

$$\begin{array}{r} x^2 - 7x + 12 = 84 \\ -84 \quad -84 \\ \hline x^2 - 7x - 72 = 0 \\ (x-10)(x+3) = 0 \\ x = 10, -3 \end{array}$$

$$x = 10$$

6.) An object is shot into the air and is represented by the equation $f(x) = -.25x^2 + 16x$, how long will it take for the object to hit the ground? $y=0$

$$-.25(-)^2 + 16(-)$$

use answers!

- (A) 4 seconds
(B) 8 seconds
(C) 64 seconds
(D) -4 seconds

6.) An object is shot into the air and is represented by the equation $f(x) = -.2x^2 + x$, how long will it take for the object to hit the ground?

$$-.2(-)^2 + (-)$$

- (A) 0 seconds
(B) 5 seconds
(C) 10 seconds
(D) 15 seconds

1.) If $f(x) = \frac{1}{x^2-3x-40}$, what are the domain restrictions? what can't "x" be?

$$x^2 - 3x - 40 = 0$$

$$(x-8)(x+5) = 0$$

$$\boxed{x \neq 8, -5}$$

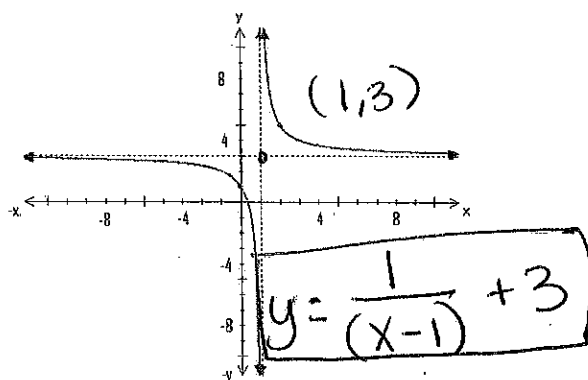
1.) YOU TRY: If $f(x) = \frac{1}{x^2-9x+18}$, what are the domain restrictions?

$$x^2 - 9x + 18 = 0$$

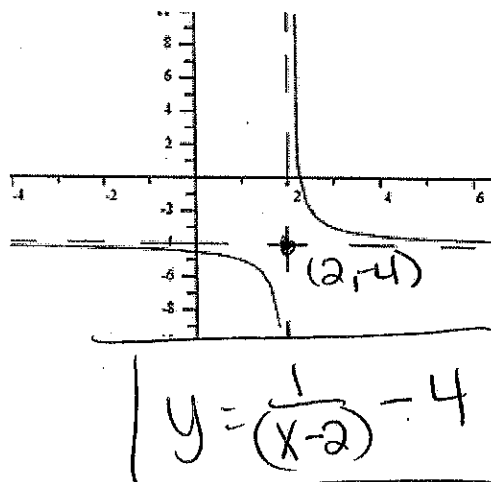
$$(x-6)(x-3) = 0$$

$$\boxed{x \neq 6, 3}$$

2.) The graph below is a translation of the parent function $f(x) = \frac{1}{x}$. What is the equation of the function? HINT - $f(x) = \frac{1}{(x-h)} + k$.



2.) YOU TRY: The graph below is a translation of the parent function $f(x) = \frac{1}{x}$. What is the equation of the function? HINT - $f(x) = \frac{1}{(x-h)} + k$.



3.) Solve $x - \frac{24}{x} = 10$ LCD: x

$$\frac{x^2}{x} - \frac{24}{x} = \frac{10x}{x}$$

$$x^2 - 24 = 10x$$

$$x^2 - 10x - 24 = 0$$

$$(x-12)(x+2) = 0$$

$$\boxed{x = 12, -2}$$

3.) YOU TRY: Solve $x + \frac{6}{x} = 5$ LCD: x

$$\frac{x^2}{x} + \frac{6}{x} = \frac{5x}{x}$$

$$x^2 + 6 = 5x$$

$$x^2 - 5x + 6 = 0$$

$$(x-3)(x-2) = 0$$

$$\boxed{x = 3, 2}$$

4.) For what x values is the function $f(x) = \frac{(x+2)}{x^2+3x}$ undefined?

$$x^2 + 3x = 0$$

$$x(x+3) = 0$$

$$x = 0 \quad x+3 = 0$$

$$\boxed{x = 0, -3}$$

4.) YOU TRY: For what x values is the function $f(x) = \frac{(x-6)}{x^2-5x}$ undefined?

$$x^2 - 5x = 0$$

$$x(x-5) = 0$$

$$x = 0 \quad x-5 = 0$$

$$\boxed{x = 0, 5}$$

Factor + cancel

x=0 → remember(0,-)

Factor + cancel

5.) $\frac{x^2-9}{x^2+2x-8} \cdot \frac{x^2+9x+20}{x^2-3x} =$

$$\frac{(x+3)(x-3)}{(x+4)(x-2)} \cdot \frac{(x+5)(x+4)}{x(x-3)} =$$

$$\boxed{\frac{(x+3)(x+5)}{x(x-2)} \text{ or } \frac{x^2+8x+15}{x^2-2x}}$$

5.) YOU TRY: $\frac{x^2+6x+9}{x^2+10x+24} \cdot \frac{x^2+3x-18}{x+3} =$

$$\frac{(x+3)(x+3)}{(x+6)(x+4)} \cdot \frac{(x+6)(x-3)}{(x+3)} =$$

$$\boxed{\frac{(x+3)(x-3)}{x+4} \text{ or } \frac{x^2-9}{x+4}}$$

6.) Find the y-intercept of $f(x) = \frac{x^2-5x-6}{(x-1)}$.

x=0

$$\frac{(0)^2-5(0)-6}{(0-1)} = \frac{-6}{-1} = 6$$

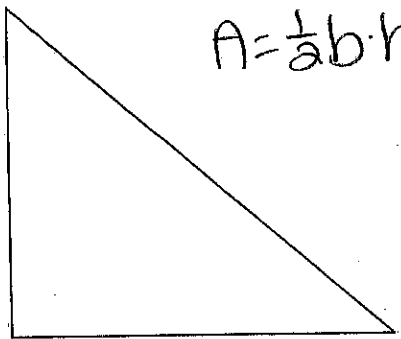
$$\boxed{(0, 6)}$$

6.) YOU TRY: Find the y-intercept of $f(x) = \frac{x^2+6x+8}{(x-2)}$.

$$\frac{(0)^2+6(0)+8}{(0-2)} = \frac{8}{-2} = -4$$

$$\boxed{(0, -4)}$$

7.) Find the area of the triangle.



$A = \frac{1}{2} b \cdot h$

$\frac{20}{10x+20}$

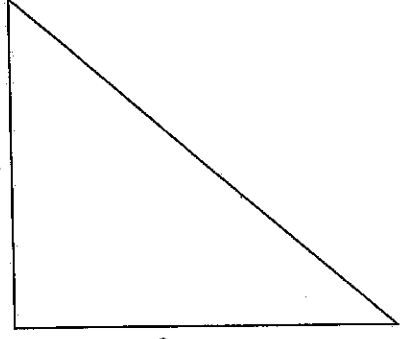
$\frac{x^2+5x+6}{x^2+2x-3}$

$$\frac{1}{2} \cdot \frac{x^2+5x+6}{x^2+2x-3} \cdot \frac{20}{10x+20}$$

$$\frac{1}{2} \cdot \frac{(x+3)(x+2)}{(x+3)(x-1)} \cdot \frac{20}{10(x+2)}$$

$$\boxed{\frac{1}{x-1}}$$

7.) YOU TRY: Find the area of the triangle.



$\frac{6x^2+30x}{x^2+6x+5}$

$\frac{x^2-x-6}{x^2+4x+4}$

$$\frac{1}{2} \cdot \frac{x^2-x-6}{x^2+4x+4} \cdot \frac{6x^2+30x}{x^2+6x+5}$$

$$\frac{1}{2} \cdot \frac{(x-3)(x+2)}{(x+2)(x+2)} \cdot \frac{3x(x+5)}{(x+5)(x+1)}$$

$$\boxed{\frac{3x(x-3)}{(x+2)(x+1)} \text{ or } \frac{3x^2-9x}{x^2+3x+2}}$$

1.) Suppose the population of Make-believe Land is 7.3 million. Studies show that the population is increasing by 5% per year. Approximately how many years will it take for the population of Make-believe Land to reach 12.3 million?

1.) YOU TRY: Suppose the population Never-never Land is 1.2 million. Studies show that the population is increasing by 3% per year. Approximately how many years will it take for the population of Never-never Land to reach 5.5 million?

2.) Given the expression $\log \sqrt[3]{\frac{x^9}{y^6}}$ the value when $\log x = 1$ and $\log y = 2$.

2.) YOU TRY: Given the expression $\log \sqrt[4]{\frac{x^{12}}{y^4}}$ the value when $\log x = 2$ and $\log y = 3$.

3.) Solve $9^{3x} = 81^{x-4}$ same bases

$$9^{3x} = 9^{2(x-4)}$$

$$3x = 2x - 8$$

$$\boxed{x = -8}$$

3.) YOU TRY: Solve $64^{2x-3} = 256^{4-x}$

$$4^{3(2x-3)} = 4^{4(4-x)}$$

$$\begin{array}{r} 6x - 9 = 16 - 4x \\ +4x + 9 \quad +9 +4x \\ \hline 10x = 25 \end{array}$$

$$\boxed{x = \frac{5}{2}}$$

4.) Joshua sets up a savings plan to transfer money from his checking account to his savings account. The first week \$5 is transferred, the second week \$10 is transferred, and the third week \$20 is transferred. If this pattern continues and he starts with \$150 in his checking account, how many weeks will pass before his balance is at/below zero?

pattern: $\begin{array}{r} 150 \\ -5 \\ \hline 145 \end{array}$ $\begin{array}{r} 145 \\ -10 \\ \hline 135 \end{array}$ $\begin{array}{r} 135 \\ -20 \\ \hline 115 \end{array}$ $\begin{array}{r} 115 \\ -40 \\ \hline 75 \end{array}$ $\begin{array}{r} 75 \\ -80 \\ \hline -5 \end{array}$ 160

$$\boxed{5 \text{ weeks}}$$

4.) YOU TRY: Brad sets up a savings plan to transfer money from his checking account to his savings account. The first week \$20 is transferred, the second week \$24 is transferred, the third week \$32 is transferred, and the fourth week \$48 is transferred. If this pattern continues and he starts with \$200 in his checking account, how many weeks will pass before his balance is at/below zero?

pattern: $\begin{array}{r} 200 \\ -20 \\ \hline 180 \end{array}$ $\begin{array}{r} 180 \\ -24 \\ \hline 156 \end{array}$ $\begin{array}{r} 156 \\ -32 \\ \hline 124 \end{array}$ $\begin{array}{r} 124 \\ -48 \\ \hline 76 \end{array}$ $\begin{array}{r} 76 \\ -80 \\ \hline -4 \end{array}$ 144

$$\boxed{5 \text{ weeks}}$$

5.) Solve $\log_4 x - \log_4 (x-1) = \frac{1}{2}$.

5.) YOU TRY: Solve $\log_3 x + \log_3 (x-6) = 3$.

6.) When a plant or animal dies, it stops acquiring Carbon-14 from the atmosphere. Carbon-14 decays over time with a half-life of 5,730 years. Write an equation to model the half-life, then determine how much of a 33mg. sample will remain after 10,000 years.

6.) YOU TRY: Element X decays over time with a half-life of 1600 years. Write an equation to model the half-life, then determine how much of a 500 gram sample will remain after 5000 years.

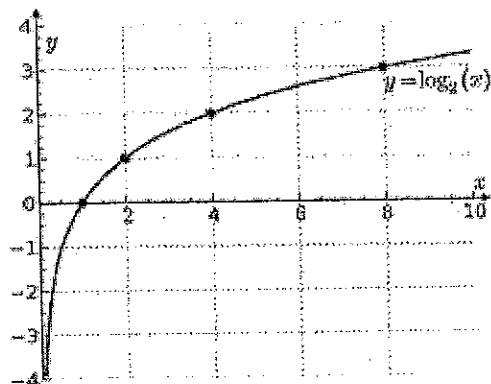
7.) A logarithmic function is graphed below, find the value of the following:

$f(2) = \underline{1}$

$f(4) = \underline{2}$

$f(8) = \underline{3}$

looking for y!



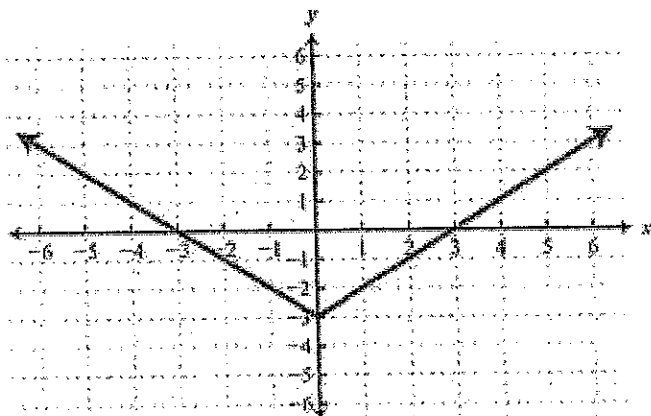
7.) An absolute value function is graphed below, find the value of the following:

$f(-3) = \underline{0}$

$f(2) = \underline{-1}$

$f(5) = \underline{2}$

looking for y!



6 looking for y value $\rightarrow p(x, y)$

$$7^x = 35$$

$$7^{-x}$$

$$5^x = 20$$

8.) If ~~7^x = 35~~, find the value of 7^{-x} .

$$7^x = 35$$

$$7^{-x} = \frac{1}{7^x} = \frac{1}{35}$$

$$7^{-x} = \frac{1}{35}$$

8.) YOU TRY: If ~~5^x = 20~~, find the value of 5^{-x} .

$$5^x = 20$$

$$5^{-x} = \frac{1}{5^x} = \frac{1}{20}$$

$$5^{-x} = \frac{1}{20}$$

9.) If Brian invests \$2000, what is the interest rate that would accrue \$4000 at the end of 20 years?

9.) YOU TRY: If Brian invests \$5000, what is the interest rate that would accrue \$8000 at the end of 15 years?

10.) Solve $(3^{-6x})^{\frac{2}{3}} \cdot (3^{15x})^{\frac{1}{5}} = 81$.

10.) Solve $(5^{-30x})^{\frac{1}{6}} \cdot (5^{24x})^{\frac{1}{3}} = 625$.

flip ditch
flip answer!

1.) What is the slope of the line $4x - 3y = 9$?

Solve for y
 $y = mx + b$

→ slope!

$$\cancel{-3}y = \frac{-4x+9}{\cancel{-3} \quad \cancel{-3}}$$

$$y = \boxed{\frac{4}{3}}x - 3$$

$$\boxed{m = \frac{4}{3}}$$

1.) YOU TRY: What is the slope of the line $3x + 2y = 6$?

$$\cancel{2}y = \frac{-3x+6}{\cancel{2} \quad \cancel{2}}$$

$$\boxed{m = -\frac{3}{2}} \quad y = \boxed{-\frac{3}{2}}x + 3$$

2.) Given that one zero of $f(x) = x^3 + 9x^2 + 23x + 15$ is -5, what are the other two zeros?

If don't remember synthetic division, plug answers in, must get 0.

$$\begin{array}{r|rrrr} -5 & 1 & 9 & 23 & 15 \\ & \downarrow & -5 & -20 & -15 \\ \hline & 1 & 4 & 3 & 0 \end{array}$$

$$x^2 + 4x + 3 = 0$$

$$(x+3)(x+1)$$

$$\boxed{x = -3, -1}$$

2.) YOU TRY: Given that one zero of $f(x) = x^3 - x^2 - 14x + 24$ is 3, what are the other two zeros?

$$\begin{array}{r|rrrr} 3 & 1 & -1 & -14 & 24 \\ & \downarrow & 3 & 6 & -24 \\ \hline & 1 & 2 & -8 & 0 \end{array}$$

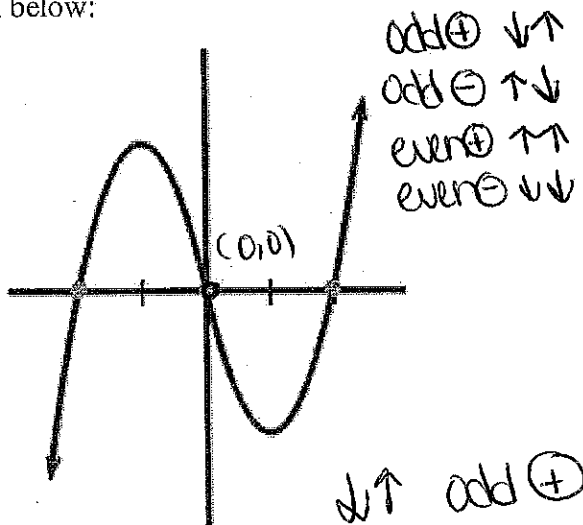
$$x^2 + 2x - 8 = 0$$

$$(x+4)(x-2) = 0$$

$$\boxed{x = -4, 2}$$

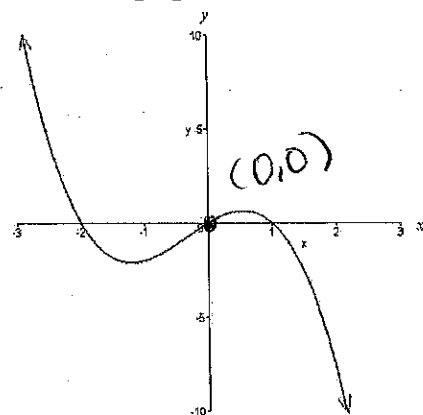
3.) Which of the following equations could represent the graph below:

end behavior + (90) as pt!



- a.) $-x^3 + 4x$
 b.) $x^3 - 4x$ $(0)^3 - 4(0) = 0$
 c.) $x^3 - 2x + 2$ $(0)^3 - 2(0) + 2 = 2$
 d.) $x^3 + 2x - 2$

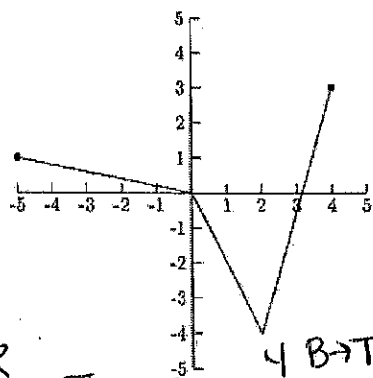
3.) YOU TRY: Which of the following equations could represent the graph below:



↑↓ odd ⊖

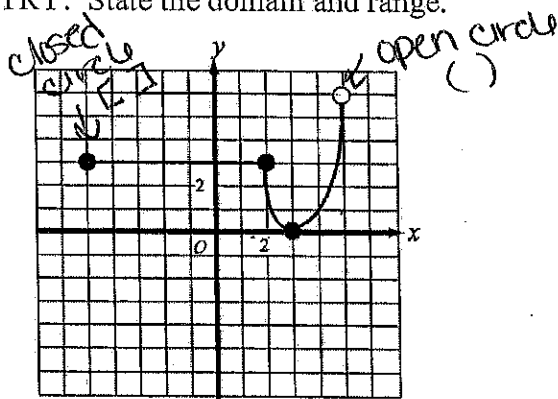
- a.) $x^3 - 2x^2 + 1$
 b.) $-x^3 + 2x^2 - 1$ $-(0)^3 + 2(0)^2 - 1 = -1$
 c.) $x^3 - x^2 - 2x$
 d.) $-x^3 + x^2 + 2x$ $-(0)^3 + (0)^2 + 2(0) = 0$

4.) State the domain and range.



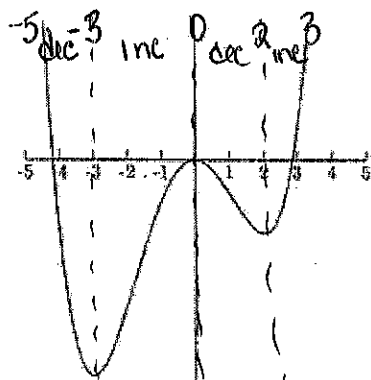
$x \in \mathbb{R}$
Domain: $[-5, 4]$ $y \in \mathbb{R}$
Range: $[-4, 3]$

4.) YOU TRY: State the domain and range.



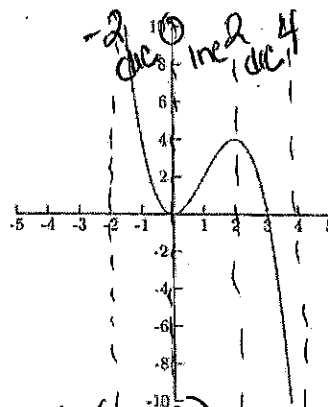
Domain: $[-5, 5)$ Range: $[0, 6)$

5.) Identify the intervals of increase and decrease.



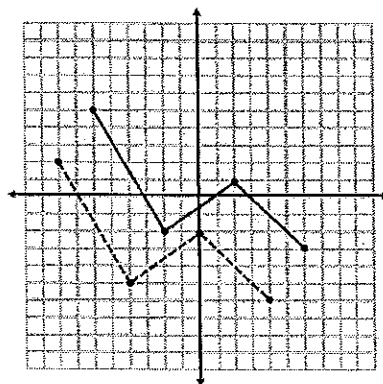
Increasing: $(-3, 0)$ and $(2, 3)$
Decreasing: $(-5, -3)$ and $(0, 2)$

5.) YOU TRY: Identify the intervals of increase and decrease.



Increasing: $(0, 2)$
Decreasing: $(-2, 0)$ and $(2, 4)$

6.) The solid graph represents the graph of $f(x)$. The dotted graph represents which transformation of the solid graph?



left 2
down 3
(h, k)
 $(-2, -3)$

a.) $f(x-2)+3$

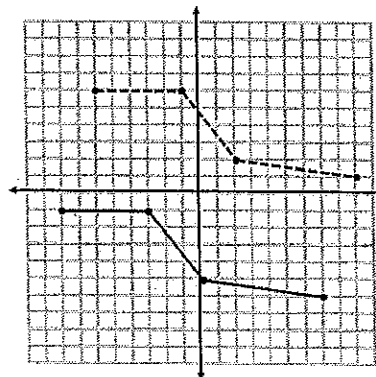
b.) $f(x+2)-3$

c.) $f(x+3)-2$

d.) $f(x-3)+2$

* his opposite *

6.) YOU TRY: The solid graph represents the graph of $f(x)$. The dotted graph represents which transformation of the solid graph?



right 2
up 7
(h, k)
 $(2, 7)$

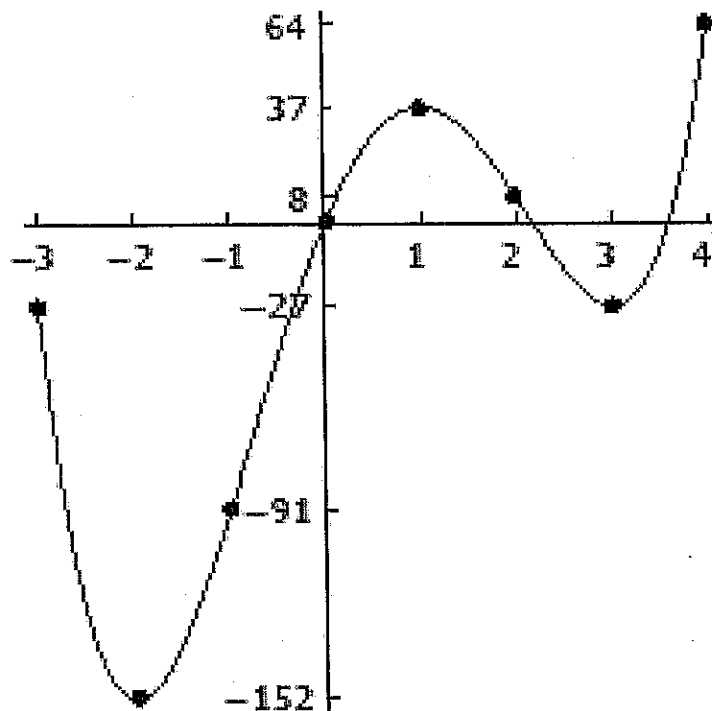
a.) $f(x+2)-7$

b.) $f(x-2)+7$

c.) $f(x+7)-2$

d.) $f(x-7)+2$

1.) Analyze the graph:



Answer the following questions related to the graph of the function above.

1) Domain: $[-3, 4]$ 2) Range: $[-152, 64]$ 3) Is the graph a function? Yes4) X-Intercept(s) $(0, 0)$ $(2, 0)$ $(3, 0)$ Y-Intercept(s) $(0, 0)$ 5) Where is the function increasing? $(-2, 1)$ and $(3, 4)$ 6) Where is the function decreasing? $(-3, -2)$ and $(1, 3)$ 7) Evaluate $f(1) =$ 378) Evaluate $f(-2) + f(4) =$ -88

$$-152 + 64$$